REGION II RST 3
DELIVERABLE SIGN-OFF SHEET

TDD No.: TO-0007-0014
TASK: 3014
TASK/SITE: Draft Area 5 Tree Removal Gamma Survey and Sampling Trip Report, February 2017/ Niagara Falls Boulevard Radiological Site
DC No.: RST3-03-D-0211

Principal Author(s)

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R. Chad Conway Date
RST 3 Site Project Manager

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_____ _____

Bernard Nwosu Date
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Timothy Benton Date
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REMOVAL SUPPORT TEAM 3
EPA CONTRACT EP-S2-14-01

March 7, 2017

Mr. Eric Daly, On-Scene Coordinator
U.S. Environmental Protection Agency
Removal Action Branch
2890 Woodbridge Avenue
Edison, NJ 08837

EPA CONTRACT No.: EP-S2-14-01
TDD No.: TO-0007-0014
DOCUMENT CONTROL No.: RST3-03-D-0211
SUBJECT: DRAFT AREA 5 TREE REMOVAL GAMMA SURVEY AN D SAMPLING TRIP REPORT, FEBRUARY 2017 – NIAGARA FALLS BOULEVAR D RADIOLOGICAL SITE, NIAGARA FALLS, NIAGARA COUNTY, N EW YORK

Dear Mr. Daly,

Enclosed please find the Draft Area 5 Tree Removal Gamma Survey and Sampling Trip Report, February 2017 for the gamma survey and sampling per formed on trees removed in Area 5 at the Niagara Falls Boulevard Radiological Site located i n Niagara Falls, Niagara County, New York on February 2, 2017. If you have any questions orcomments, please do not hesitate to contact me at (832) 347-3430.

Sincerely,

Weston Solutions, Inc.

Chad Conway

R. Chad Conway
RST 3 Site Project Manager

Enclosure
cc: TDD File No.: TO-0007-0014

DRAFT AREA 5 TREE REMOVAL GAMMA SURVEY AND SAMPLING TRIP REPORT, FEBRUARY 2017

Niagara Falls Boulevard Radiological Site
Niagara Falls, Niagara County, New York

Prepared for:

U.S. Environmental Protection Agency
Region II – Removal Action Branch
Edison, New Jersey 08837

Prepared by:

Removal Support Team 3
Weston Solutions, Inc.
Edison, New Jersey 08837

DC No.: RST3-03-D-0211
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March 2017

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DRAFT AREA 5 TREE REMOVAL GAMMA SURVEY AND SAMPLING TRIP REPORT, FEBRUARY 2017

SITE NAME: Niagara Falls Boulevard Radiological Site
DC No.: RST3-03-D-0211
TDD No.: 0007-0014
CERCLIS ID: NYN000206699
EPA ID: A23Q
EVENT DATE: February 2, 2017

1.0 Introduction:

In 1978, the U.S. Department of Energy (DOE) conducted an aerial radiological survey of the Niagara Falls region and identified more than 15 properties having elevated levels of radiation above background levels. It is believed that in the early 1960s slag from the Union Carbide facility located on 47th Street in Niagara Falls was used as fill on the properties prior to paving. The Union Carbide facility processed ore containing naturally-occurring high levels of uranium and thorium to extract niobium. The slag contained sufficient quantities of uranium and thorium to be classified as a licensable radioactive source material. Union Carbide subsequently obtained a license from the Atomic Energy Commission (AEC), now the Nuclear Regulatory Commission (NRC), and the State of New York; however, the slag had already been used as fill throughout the Niagara Falls region prior to licensing. Based on the original survey and subsequent investigations, it is believed that the radioactive Union Carbide slag was deposited on the Niagara Falls Boulevard Radiological Site (the Site).

2.0 Site Location:

The Site is located in a mixed commercial and residential area of Niagara Falls, New York. The Site consists of two parcels, namely 9524 and 9540 Niagara Falls Boulevard and it encompasses approximately 2.53 acres. Currently, the 9524 Niagara Falls Boulevard property contains a bowling alley and an asphalt parking lot; the 9540 Niagara Falls Boulevard property is occupied by a hardware store, Greater Niagara Building Center, Inc. (GNBC) and an asphalt parking lot. The properties are bordered to the north by a wooded area; to the east by a church; to the south by Niagara Falls Boulevard, beyond which is a residential area; and to the west by a hotel and residential area. Refer to Attachment A, Figure 1: Site Location Map.

3.0 Site History:

In September/October 2006 and May 2007, the New York State Department of Environmental Conservation (NYSDEC) conducted radiological surveys of the interior and exterior of both properties on several occasions using gamma detectors, Exploranium-135 and Ludlum Model 2221 Ratemeter/Scaler (Ludlum-2221). With the exception of an office area and storage space at 9540 Niagara Falls Boulevard that were constructed after the original building, directly on top of the asphalt parking lot, interior radiation levels obtained with Exploranium-135 were relatively low. The highest reading in the newer area was 115 micro roentgens per hour (µR/hr); elsewhere throughout the building, radiation levels generally ranged between 10 and 20 µR/hr. Exterior readings taken at waist height generally ranged between 10 and 350 µR/hr, while the maximum reading of 600 µR/hr was recorded at contact (*i.e.*, at the ground surface). At a fenced area behind the building located at 9540 Niagara Falls Boulevard, waist-high readings ranged between 200 and

450 µR/hr, and at-contact readings ranged between 4 50 and 750 µR/hr. Elevated readings were also observed on the swath of grass between the 952 4 Niagara Falls Boulevard property and the adjacent property to the west that contains a hotel , and in the marshy area beyond the parking lot behind the buildings. Two biased samples of slag w ere collected from locations that exhibited elevated static Ludlum-2221 readings: one slag samp le collected from an area of loose blacktop indicated a reading of 515,905 counts per minute (c pm) and the second slag sample collected in the marshy area indicated a reading of 728,235 cpm. During a reconnaissance performed by the New York State Department of Health (NYSDOH) and NY SDEC on July 9, 2013, screening activities with a hand-held pressurized ion chamber (PIC) unit around an area of broken asphalt indicated gamma radiation levels at 200 µR/hr and 5 00 µR/hr from a soil pile containing slag at the Site. Readings over 600,000 cpm were recordedwith a sodium iodide scintillator from the soil and slag pile.

On September 10, 2013, the U.S. Environmental Protection Agency (EPA) and Weston Solutions Inc., Site Assessment Team (SAT), conducted gamma r adiation screening of the 9524 Niagara Falls Boulevard property using Ludlum-2221. On Dec ember 4 and 5, 2013, further radiological survey information was collected from the 9524 and 9540 Niagara Falls Boulevard properties, as well as the church property located further east of the two site parcels. The highest gamma radiation screening results were recorded from the exposed soil area in the rear northern portion of the 9540 Niagara Falls Boulevard property. From December 5 through 7, 2013, SAT documented and delineated the areas of observed con tamination at the Site by measuring the gamma radiation exposure rates and determining where the gamma radiation exposure rate around the source equal or exceed two times (2x) the site-specific background gamma radiation exposure rates. The areas of observed contamination were def ined by site-attributable gamma radiation exposure rates, as measured by a survey instrument held 1 meter above the ground surface, which equal or exceed 2x the site-specific background gam ma radiation exposure rate. An area of the Site, approximately 168,832 square feet (sq. ft.), indicated gamma radiation levels exceeding 2x the background measurement of 8,391 counts per minute (cpm).

Subsequent Removal Assessments were conducted in De cember 2013 by SAT and in July 2015, August 2015 and March 2016 by Weston Solutions Inc., Removal Support Team 3 (RST 3). The Removal Assessments were conducted in order to verify potential releases of radiation-containing materials in soil and fill material associated with slag from the former Union Carbide facility, determine radiation source areas, and delineate the extent of on-site contamination through radiological surveys and soil sampling events. The screening and analytical results from these events confirmed prior findings which indicated the presence of radioactive contamination at location onsite.

As part of Removal Action activities, on August 8, 2016 through December 20, 2016, EPA's Emergency and Rapid Response Services (ERRS) contra ctor, Guardian Environmental Services (GES) conducted removal operations of contaminated soil/slag, within Area 5 (located on the northwest section of the Site). Before removing th e contaminated soil/slag, it was necessary to clear the existing vegetation and approximately 100trees located within Area 5. Prior to removing the trees, the coordinates (latitude and longitude)of each tree was recorded using a Trimble Global Positioning System (GPS). Once the trees were remo ved, a tag number stored in the GPS was assigned to each tree. The branches and canopies of the trees removed from Area 5 were reduced to chips on the order of 1 inch to 2 inches across in size utilizing a portable wood chipper. The remaining trunks of the trees were staged on poly s heeting and fenced off. Once all the

contaminated soil/slag was removed (approximately 2,419 cubic yards) from Area 5, the excavated area was surveyed for gamma radiation to ensure that all contamination was removed. The excavated area was backfilled with imported stones to the original grade.

4.0 Personnel On-Site:

Name	Representing	Duties On-Site
Eric Daly	U.S. EPA, Region II	On-Scene Coordinator
Lyndsey Nguyen	U.S. EPA, Region II	Radiation Health Physicist
Chad Conway	Weston Solutions Inc., RST 3, Region II	Site Project Manager, Site Health and Safety, Tree Gamma Screening/Survey and Sampling
Michael Lang	Weston Solutions Inc., RST 3, Region II	Tree Gamma Screening/Survey and Sampling

RST 3 – Removal Support Team 3
U.S. EPA – United States Environmental Protection Agency

5.0 Summary of Site Activities:

On February 2, 2017, RST 3 and ERRS were tasked by EPA to relocate tree trunks which were staged on-site during the August 2016 removal operations to two predetermined locations within Area 5. Prior to relocating the tree trunks, RST 3 utilized a Ludlum (Model 3) Pancake Probe to perform radiological screening/survey and characterized background areas at two zones within Area 5 in order to provide EPA with screening/survey data which was used to establish Site Specific Screening Level (SSSLs) for determining if the trees were contaminated with elevated levels of radiation. The first zone (Zone 1) located on the west side of Area 5, measuring 60 feet by 7 feet, was used to conduct gamma survey of trees selected for sampling. The second zone (Zone 2) located on the north side of Area 5, measuring 60 feet by 30 feet, was used to stage the remaining trees after they were surveyed for gamma radiation.

Trees designated for sampling were selected from locations in Area 5 where the highest gamma readings were identified during a gamma survey and soil/rock sampling event conducted prior to the commencement of removal operations. The initial gamma survey results were used to identify areas where the soil/rock samples would be collected. During the soil sampling event, a total of 98 soil/rock samples were collected from ground surface to approximately 48 inches below ground surface (bgs) in 6 inch intervals. Each soil/rock sample was analyzed using the onsite High-Purity Germanium (HPGe) detector which provided quantitative analytical results. The analytical results of the soil/rock samples generated by the HPGe detector indicated a correlation with the results of the initial gamma survey; such that, soil/rock samples with the highest analytical results values corresponded with sampling locations with the highest survey readings. Therefore, tree selection for sampling was biased towards locations with the highest gamma survey readings and highest HPGe soil analytical results. In addition, variation and locations of trees within Area 5 was also a criteria for selecting trees for sampling. EPA determined that collecting tree trunk boring samples from 10 percent (%) of the total number of trees removed from Area 5 would provide representative sampling of all the trees removed from Area 5. A total of 10 trees removed from Area 5 were initially selected for sampling. The assumption was that trees within the identified locations may have potentially absorbed radioactive materials and/or potentially re-suspended onto the bark, and therefore met the criteria required for sampling and further analysis. To ensure that representative sampling of all the trees was met, five additional trees were sampled from random

locations selected by EPA within Area 5. A total of fifteen trees were finally selected for sampling. The selected trees were staged in a separate location on the southeast side of Area 5 where they were sampled and then analyzed via the HPGe detector. Refer to Attachment B: Photographic Documentation Log.

6.0 Sampling and Analysis:

Prior to relocating the trees removed from Area 5, RST 3 collected 10 woodchip samples comprising branches and canopies of the trees removed from Area 5 during the August 8, 2016 through December 20, 2016 mobilization. The woodchip pile was evenly spread to ensure that each sample collected was a homogenized representation of all the branches and canopies of the trees removed from Area 5. The sample volume collected from each woodchip sample location was transferred into a 16 ounce (oz) plastic jar for quantitative gamma spectrometry analysis utilizing the onsite HPGe detector.

Gamma ray spectrometry is an analytical method that allows the identification and quantification of gamma emitting isotopes in a variety of matrices. In one single measurement with little sample preparation, gamma ray spectrometry allows for the detection of several gamma emitting radionuclides in a sample. The measurement gives a spectrum of lines, the amplitude of which is proportional to the activity of the radionuclide and its position on the horizontal axis gives an idea on its energy.

As the trees were being relocated from the initial staging location to the predetermined zones in Area 5, the entirety of each tree was screened for gamma radiation using a Ludlum Pancake Probe in order to obtain a qualitative average reading, and ensure that no tree exceeded EPA's SSSL of 40 cpm established for Zone 1 and 47 cpm established for Zone 2. The majority of the trees surveyed for gamma radiation were staged in Zone 2. Trees selected for sampling were moved to Zone 1 and then thoroughly surveyed again for gamma radiation. The survey readings for each tree did not exceed the SSSLs established by EPA for Zone 1 or Zone 2. The highest gamma survey result observed for trees in Zone 1 was 37 cpm which was below the SSSL of 40 cpm, and the gamma surveys results for trees in Zone 2 were below the SSSL of 47 cpm.

Utilizing a hand-held electric drill equipped with an auger bit, RST 3 collected samples from the tree trunks staged at Zone 1. The samples were collected at the base of each tree by drilling from the exterior of the trunk to the center, such that every ring within the tree was sampled. Approximately 5 to 7 boring were required to attain the sample volume needed for analysis. The extracted samples from the tree borings were collected in a clean polyethylene bag. The sample volume collected from each tree was transferred into a 16 oz plastic jar for quantitative gamma spectrometry analysis utilizing the onsite HPGe detector.

7.0 Gamma Survey and Analytical Results Summary:

The gamma survey results for the woodchip samples, the trees selected for HPGe analysis from Zone 1, and the remaining trees surveyed and staged in Zone 2 did not indicate readings exceeding EPA's established SSSL of 40 cpm for Zone 1 and 47 cpm for Zone 2.

Based upon EPA's interpretation of the analytical results of the tree boring samples generated by the HPGe detector, no radioactive material from Area 5 was taken up by the trees via the root system, absorbed into the trees, or adhered to the exterior of the trees. Therefore, the trees removed

from Area 5 can be transported offsite without any restrictions. Refer to Attachment C: Table 1: Area 5 HPGe Woodchip Analytical Results Summary Tab le and Table 2: Area 5 HPGe Tree Boring Analytical Results Summary Table.

Report prepared by: Chad Conway Date: 3/7/2017

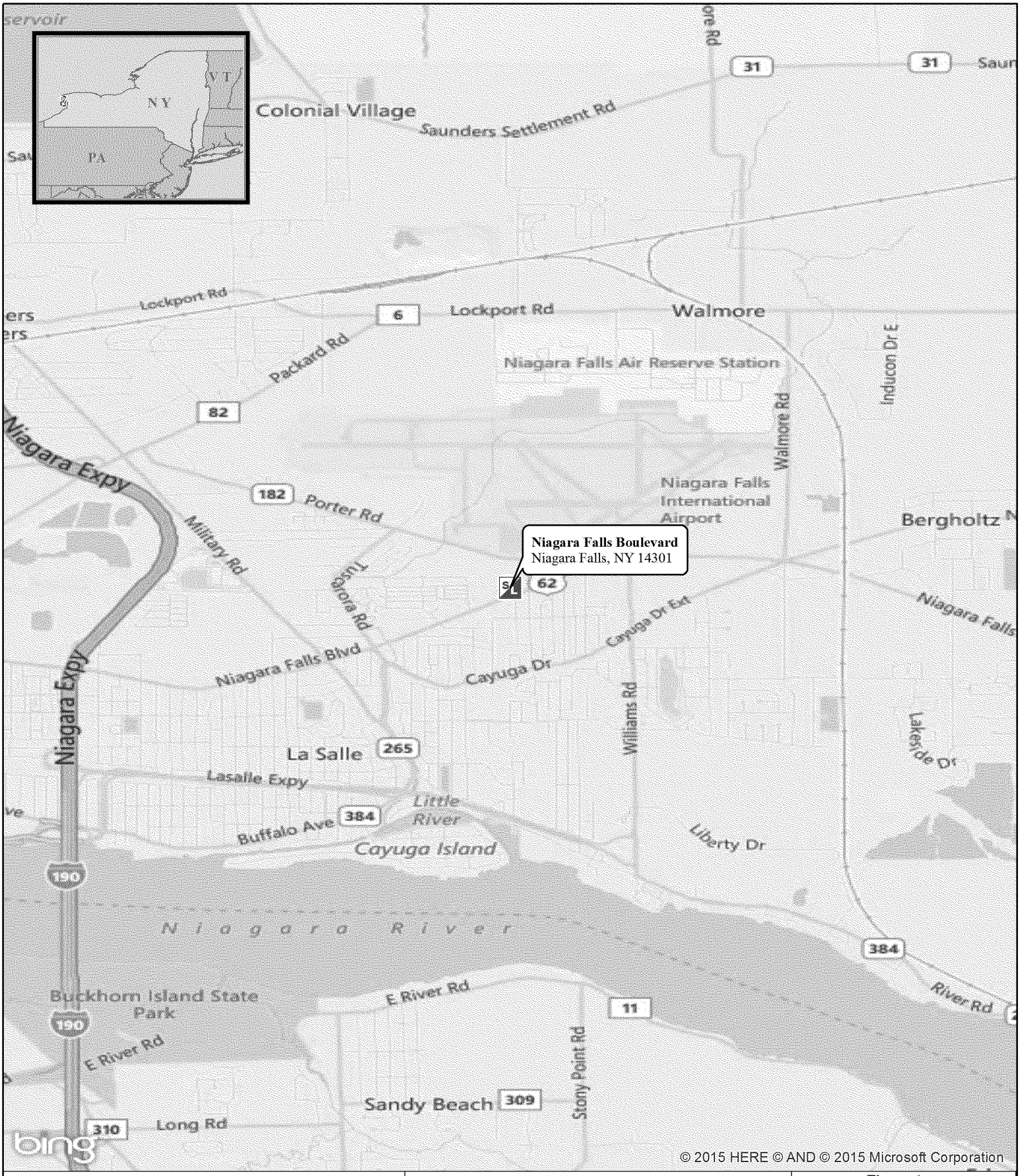
R. Chad Conway
RST 3 Site Project Manager

Report reviewed by: Bernard Nwosu Date: 3/7/2017

Bernard Nwosu
RST 3 Group Leader

Attachment A

Figure 1: Site Location Map



Legend

Site Location

N

0 0.25 0.5 1 1.5 2 Miles

Weston Solutions, Inc.
East Division

In Association With
Scientific and Environmental Associates, Inc.,
Environmental Compliance Consultants, Inc.,
Avatar Environmental, LLC, On-Site Environmental,
Inc.and Sovereign Consulting, Inc

Figure 1:
Site Location Map

Niagara Falls Boulevard Site
Niagara Falls, New York

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL SUPPORT TEAM 3
CONTRACT # EP-S2-14-01

DATE MODIFIED: 7/23/2015

GIS ANALYST:	T. Benton
EPA OSC:	E. Daly
RST SPM:	B. Nwosu
FILENAME:	140723_SITELOCATIONMAP.MXD

\\FSED2DATA1\GISDATA\RST_3\00060061\MXD\140723_SITELOCATIONMAP.MXD

Attachment B

Photographic Documentation Log

Photographic Documentation Log
Niagara Falls Boulevard Radiological Site
Niagara Falls, Niagara County, New York
February 2, 2017

Photograph 1: View of trees removed from Area 5 which were placed in a pile at the initial staging area of the Niagara Boulevard Radiological Site (the Site).

Photograph 2: View of Zone 1 located on the west side of Area 5, measuring 60 feet by 7 feet. Zone 1 was used to conduct gamma survey of trees selected for sampling.

Photograph 3: View of trees removed from Area 5 which were being relocation from the initial staging area to the designated zones within Area 5.

Photograph 4: View of Weston Solutions Inc., Removal Support Tea m 3 (RST 3) member conducting gamma screening/survey of a tree utilizing a Ludlum Model 3 Pancake Probe prior to staging the tree in Area 5.

Photograph 5: View of U.S. Environmental Protection Agency's (EP A) Emergency and Rapid Response Services (ERRS) contractor, Guardian Environmental Services (GES) staging a preselected tree in Zone 1 for gamm a screening/survey and sampling.

Photograph 6: View of RST 3 member conducting gamma screening/sur vey of a predetermined tree in Zone 1 prior to sampling.

Photograph 7: Utilizing a hand-held electric drill equipped wit h an auger bit, RST 3 collected samples at the base of each tree by drilling from the exterior of the trunk to the center, such that every ring within the tree was sampled.

Photograph 8: View of Zone 2 located on the north side of Area 5 , measuring 60 feet by 30 feet. Zone 2 was used to stage the remaining trees after they were surveyed for gamma radiation

Photograph 9: View of a tree boring sample. Approximately 5 to 7 boring were required to attain the sample volume needed for analysis. The extracted samples were collected in a clean polyethylene bag. The sample volume collected from each tree was transferred into a 16 oz plastic jar for quantitative gamma spectrometry analysis utilizing the onsite High-Purity Germanium (HPGe) detector.

Attachment C

Table 1: Area 5 HPGe Woodchip Analysis Results Su mmary Table

Table 2: Area 5 HPGe Tree Boring Analysis Results Summary Table

Table 1
Area 5 HPGe Woodchip Analytical Results Summary Table
Niagara Falls Boulevard Radiological Site
Niagara Falls Boulevard, Niagara Falls, New York
February 2, 2017

	RST 3 Sample Number									
	WCP-01	**WCP-02**	**WCP-03**	**WCP-04**	**WCP-05**	**WCP-06**	**WCP-07**	**WCP-08**	**WCP-09**	**WCP-10**
Radionuclide										
Thorium-232 (Th-232)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Radium-228 (Ra-228)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Actinium-228 (Ac-228)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-228 (Th-228)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Radium-224 (Ra-224)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead-212 (Pb-212)	**0.4217**	**0.1658**	ND	ND	ND	**0.9061**	ND	ND	**1.24**	**0.6201**
Uranium-238 (U-238)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-234 (Th-234)	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.0319**
Protactinium (Pa-234)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium- 234 (U-234)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-230 (Th-230)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Radium-226 (Ra-226)	**-0.7899**	ND	**-0.2074**	**-0.1869**	**-0.1066**	ND	**-0.0162**	**0.9084**	**0.9696**	**1.24**

Notes:

RST 3 - Removal Support Team 3.

pCi/g - Picocuries per gram.

ND - Not detected. The sample was below the Minimum Detectable Activity (MDA) for that particular radionuclide.

All samples were analyzed using a High Purity Germanium (HPGe) detector.

Result values in bold font indicate detected concentrations.

Table 2
Area 5 HPGe Tree Boring Analytical Results Summary Table
Niagara Falls Boulevard Radiological Site
Niagara Falls Boulevard, Niagara Falls, New York
February 2, 2017

	RST 3 Sample Number														
	TREE-41	**TREE-26**	**TREE-45**	**TREE-55**	**TREE-65**	**TREE-35**	**TREE-33**	**TREE-39**	**TREE-58**	**TREE-30**	**TREE-54**	**TREE-36**	**TREE-50**	**TREE-42**	**TREE-28**
Radionuclide															
Thorium-232 (Th-232)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Radium-228 (Ra-228)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Actinium-228 (Ac-228)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-228 (Th-228)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Radium-224 (Ra-224)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead-212 (Pb-212)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium-238 (U-238)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-234 (Th-234)	**1.08**	**0.1629**	**-0.4218**	ND	ND	**-0.0659**	ND	ND	ND	ND	ND	**0.3257**	**-0.2334**	ND	**1.12**
Protactinium (Pa-234)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium- 234 (U-234)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thorium-230 (Th-230)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Radium-226 (Ra-226)	**-0.6496**	**-0.6113**	**0.5396**	ND	ND	**0.5164**	**0.3358**	ND	ND	ND	**0.3504**	ND	**-0.6059**	**0.0254**	ND

Notes:
RST 3 - Removal Support Team 3.
pCi/g - Picocuries per gram.
ND - Not detected. The sample was below the Minimum Detectable Activity (MDA) for that particular radionuclide.
All samples were analyzed using a High Purity Germanium (HPGe) detector.
Result values in bold font indicate detected concentrations.